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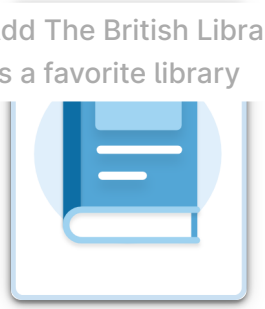

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Solving Combinatorial Optimization Problems by Simulated Annealing, Genetic Algorithms, and Neural Networks

ABSTRACT

We study four methods, namely simulated annealing, genetic algorithms, Hopfield nets, and mean field annealing, for solving optimization problems. We use the Traveling Salesman Problem, a famous NP-complete problem, as our example for the study. Based on our studies, we select one of the most interesting techniques, the Hopfield neural network, to solve a very important practical problem in computer design, the global wire routing problem for gate arrays. To the best of our knowledge, neural network methods have never been used to solve the global routing problem. Because the results of such a study will be of great interest to people, not only in the artificial neural network field but also in design automation, we implement a new gate array global router based on the Hopfield net model.

We have successfully routed sample gate arrays using our new router. These results are encouraging and call for further work.

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